



UNITED STATES PATENT AND TRADEMARK OFFICE

QW

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/802,664	03/09/2001	Rajendra D. Pendse	60084.300301	7522
22470	7590	04/28/2004	EXAMINER	
HAYNES BEFFEL & WOLFELD LLP P O BOX 366 HALF MOON BAY, CA 94019			LEE, HSIEN MING	
			ART UNIT	PAPER NUMBER
			2823	

DATE MAILED: 04/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/802,664	Applicant(s) PENDSE, RAJENDRA D.	
	Examiner Hsien-Ming Lee	Art Unit 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on 19 April 2004.

2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 1-9 and 18-35 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) 1-9, 19-30 and 32-35 is/are rejected.

7) ☒ Claim(s) 18 and 31 is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____	4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) 6) <input type="checkbox"/> Other: _____
---	--

DETAILED ACTION

Remarks

1. Claims 1-9 and 18-35 are pending in the application.
2. Final rejection is withdrawn in response to applicant's arguments.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-4, 7-9, 19-25, 28-30 and 32-35 are rejected under 35 U.S.C. 102(b) as being anticipated by Hogerton et al. (US 5,714,252).

In re claims 1-3, 9, Hogerton et al., in Figs. 1A-1C and related text, teach the claimed method for forming a flip chip interconnection structure, comprising:

- providing a first member 14/16, wherein 16 is a metal bump comprising a softer metal such as gold, copper or silver (col. 6, lines 23-26), on an IC chip 10 and a second member 24/26 on a substrate 18, the first member 14/16 comprising a deformable material having a low yield strength and a high elongation to failure (i.e. copper or gold or silver) and the second member 24/26 having surface asperities (i.e. an irregular surface) on a surface on a part of the second member 24/26 to be bonded with the first member 14/16; and
- bringing the first member 14/16 into contact with the surface on the second member 24/26 and pressing the first 14/16 and second 24/26 members against one another

Art Unit: 2823

using a force sufficient to cause plastic flow of part of the first member 14/16 into the surface asperities on the second member 24/26 (col. 3, lines 55-58 and col. 6, lines 51-65).

In re claims 4, 7, 25 and 28, the second member 24/26 in Hogerton et al. act as a surface pad; and has a plated finish because the surface of the second member is electroplated without any oxide formed thereon (col. 6, lines 33-38).

In re claims 8 and 29, the bump 16 comprises one of set of such bumps 16 (Fig. 1A).

In re claims 19 and 32, the part of the second member 24/26 to be bonded with the first member 14/16/ has a generally reversed trapezoidal shape with rounded corners in transverse sectional view (i.e. a concave shape in transverse sectional view) and the second surface (i.e. a the bottom portion of the concave shape) comprising a plateau having a width smaller than a width of the first member 16 (Fig. 1C).

In re claims 20-21, 30, 33 and 34, Hogerton et al. also teach, prior to pressing the first 14/16 and second 24/26 members against one another, dispensing a curable adhesive 30 onto a mating surface of the substrate 26/24/18 and the IC chip 10 (Fig. 1B).

In re claims 22-24 and 35, Hogerton et al., in Figs. 1A-1C, also teach the method, comprising:

- providing a first member 14/16/ on an IC chip 10 and a second member 24/26 on a substrate 18, wherein the second member 24/26 being provided with asperities on a surface thereof since the surface is not flat, the first member 14/16 comprising a deformable material having a low yield strength and a high elongation to failure and the second member 24/26 having a surface adjacent an edge (i.e. the rounded corner

Art Unit: 2823

of the concave shape) on a part of the second member 24/26 to be bonded with the first member 14/16; and

- bringing the first member 14/16/ into contact with the second member 24/26 surface and pressing the first 14/16 and second 24/26 members against one another using a force sufficient to cause plastic flow of part of the first member 14/16 around the edge.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1-4, 6-9, 22 and 27 are rejected under 35 U.S.C. 102(e) as being anticipated by Ikegami (US 6,194,781).

Ikegami, in Figs. 2-4 and related text, teaches the claimed method for forming a flip chip interconnection structure, comprising:

- providing a first member 12, wherein the first member 12 is a metal bump comprising a softer metal such as gold (col. 6, lines 6-8), on an IC chip 10 and a second member 15, which is a pad (col. 6, lines 28-29), on a substrate 13, wherein the second member 15 has a via opening 15a, the first member 12 comprising a deformable material having a low yield strength and a high elongation to failure (i.e. gold) and the second member 15 having surface asperities (i.e. an irregular surface having the opening 15a)

Art Unit: 2823

on a surface on a part of the second member 15 to be bonded with the first member 12, wherein the second member 15 has a surface adjacent an edge (i.e. the edge of the via opening 15a) on a part of the second member 15 and a margin of the via opening 15a comprising the edge; and

- bringing the first member 12 into contact with the surface on the second member 15 and pressing the first 12 and second 15 members against one another using a force sufficient to cause plastic flow of part of the first member 12 into the surface asperities on the second member 15 (Figs. 3-4).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 5 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hogerton et al., in view of Yuzawa et al. (US 6,335,568).

Hogerton et al. substantially teach the claimed method, as stated above, but fails to teach that the second member is a lead. However, Hogerton et al. further suggest that the teaching is illustrative rather than restrictive and can be modified without departing from the scope and spirit of the invention (col.16, lines 11-21).

In fact, the lead is a very common and necessary member in semiconductor packaging, wherein the lead (i.e. equivalent to the second member) is usually electrically bonded to the

bump (i.e. equivalent to the first member) for forming the interconnecting structure, as evidenced by Yuzawa et al. (col. 5, lines 13-40).

Therefore, it would have been obvious to one of the ordinary skill in the art at the time the invention was made to form the flip chip interconnecting structure of Hogerton et al. with the first member being the deformable material (i.e. the bump) and the second member being the lead, as taught by Yuzawa et al., since by this manner it would be able to plastically deform the lead and to electrically bond the bump for forming the interconnecting structure (col. 5, lines 13-40, Yuzawa et al.).

Allowable Subject Matter

9. Claims 18 and 31 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record neither teaches nor suggests that a width of the second member surface is *smaller* than a width of the first member.

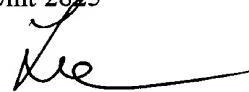
11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsien-Ming Lee whose telephone number is 571-272-1863. The examiner can normally be reached on M-F (9:00 ~ 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 571-272-1855.

Art Unit: 2823

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hsien-Ming Lee
Examiner
Art Unit 2823

A handwritten signature in black ink, appearing to read 'Hsien-Ming Lee', with a long horizontal flourish extending to the right.

April 27, 2004